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**"Open End Spinning Machine"**

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(54) Title: Open End Spinning Machine

(57) Summary:

The invention concerns an open end spinning machine for the spinning of a yarn from a continuous fiber band. The said spinning machine is a component of an assembly of multiple, independent machines. The said assembly, at least on one side, possesses a plurality of spinning stations. These stations are aligned in sequence and each comprises at least fiber band supply holders, spinning units and yarn winding positions. On the at least one side of the said assembly, a travel means is provided with agents for service at each station. It is the purpose of the invention to create, with simple means, an enablement of a unification of essential machine components for open end spinning machines of various types. This purpose is achieved in that, in each spinning station, a mechanism for the transmission of torque from at least one spinning machine drive is installed in accord with the invention. The proposed spinning machine is so made, that simultaneously means for the drawing of the fiber band is present, to form a drawing apparatus. A first, releasable draw zone (of three) is established, wherein the draw zone possesses equipment for torque transmission and utilizes the holder of fiber band in the module of the spinning unit, as well as activates a fiber band drawing apparatus. In the case of the last draw zone, at least one roll of the last roll pair of the drawing apparatus, the drive of which is derived from the mentioned power sources of the machine. At this point is provided a spinner device for the production of a false twist of the fiber band. In one embodiment, the drive for this is from the mentioned drive shaft of the machine, applied upstream therefrom in the direction of the moving, undrawn fiber band.

DE 39 31 463  
"An Open End Spinning Machine"

Description

The invention concerns an open end spinning machine for the spinning of yarn or thread (hereinafter referred to as "yarn") and which yarn is made from a continuous fiber band. The said open end spinning machine is a part of a row of successive spinning stations, accessible from at least one side, each of which includes a fiber band container, a spinning machine and yarn spools. A single power source services the entire spinning facility or at least an individual station.

Arrangements of rows of open end spinning machines equipped with spinning units for the manufacture of yarn from a continuous fiber band are already known.

The most readily known of the open end spinning machines are those open end spinning machines, the spinning units of which are provided with a spinning rotor. Likewise well known are open end spinning machines for the production of bundle-yarn, wherein the fiber band is refined by means of stretching, pulling or drawing (hereinafter, referred to as "drawing"). The fiber band, which has been so refined is finally subjected to a pneumatic rotor or drawn through two successive nozzles under apportioned tension. The pulling apparatuses of these machines consist of drawing roll pairs, of which there may be three, and which are placed in a vertical succession in the machine and on this account, may be available for a plurality of spinning stations and in some embodiments, can serve in common for the entire active side of the successive machines. The pressure rollers, which form half a roller pair, of the drawing apparatus are advantageously aligned on a swing-out arm, either for one spinning station alone or for two neighboring spinning stations.

Likewise known, are open end spinning machines with a drawing apparatus, which are provided with continuous drawing rollers and possess a rotating hollow spindle, upon which fibers are wound. Simultaneously, a formed separate fiber band, in its direction of travel, is guided interiorly through the rotating hollow spindle. Thereby the core of the yarn to be made is encased by a winding by the said fiber band and the core itself remains without tension.

In common knowledge is an open end spinning machine with a spin rotor and a drawing apparatus wherein, for each separate spinning station, an individual drive with a shut-down circuit exists. The drawing system is constructed, either out of a system of drawing rollers, wherein the last roller thereof runs with the highest circumferential speed, in order that the fed in fiber band is optionally reduced to the finest possible individual fiber form. In the case of another embodiment, the draw rollers are used only for the refinement of the fiber stock, while for reduction into individual fibers, a comb equipped roll is employed. The flow of the free fibers is collected in the collection circumference of for example, a spin rotor bowl, whereby these free fibers become classified as a mini-fiber band, to which, by means of rotation, false twist can be imparted and thereby the said mini-fiber band becomes a yarn.

Also known is an open end spinning machine, the spinning unit of which has been developed out of delivery apparatus, namely a combing roll and a stationary spinning bowl, in which, first, a flow of loose fibers is fed in and second, a tangential stream of air is introduced, which, within the spinning bowl, a rotary turbulence builds up, by which the therein entrained free yarn ends receive their twist.

The scope of application of the open end spinning machines, as time goes on, has been expanded and its productivity parameters considerably increased. In spite of this, the application has been oriented only toward certain types of uses, for which designed installation would be technologically and economically of advantage. Consequently, a search has been active for decades, seeking new ways for increasing the number of applications with advantageous installations wherein newer types of open end spinning machines would be developed.

The disadvantages of some open end spinning machines lie predominately in the economy of their manufacture. Other open end spinning machines are applicable only within the special character of the yarns made therewith, resulting in only for a narrow assortment of large area textiles.

The open end spinning machines which find the greatest use are equipped with a rotor and prove themselves economical for manufacture of a fine yarn, when compared with ring-spin machines. When compared with nozzle spinning machines, the results are often disappointing.

In the case of the nozzle based spinning machines, the disadvantage is that, for example, manufactured bundle yarn exhibits a variable surface character and in that some of its more useful characteristics reduce the area of its application, and therewith also limits the lots assigned to this machine. The possibly biased conception of the difference between the nozzle spinning machine and the rotor machine is so strong, that a unification of components would be possible only in a very limited scope.

On this account, the production costs rise and especially, the expense of introducing these machines into production likewise increases. Furthermore, the necessary costs for equipment to allow the automation of production with the nozzle machines are high. The invention restricts, that is to say, prevents the above mentioned disadvantages of the state of the technology.

It is the purpose of the invention, to create with simple means an arrangement to enable a unification of essential machine components for open end spinning machines of various types.

The essence of the invention is that, at each spinning station, for at least one of the driving means of the machine, above the fiber band container and in the module of the spinning unit, a mechanism for the transmission of the torque of one of the said drive units is located. Also, so located, are draw rolls for pulling the fiber band. This establishes a first draw zone with the said agent for the transmission of the torque. This agent for the transmission of torque, with dependency on the existing operational condition of the spinning station, also releasably incorporated in the draw zone. By the last draw zone, the at least one roller of the final roller pair of the drawing apparatus, is powered by a drive, which is derived from one of the mentioned machine driving means.

Behind this said final roller – that is, in the direction of the advancing movement of the fiber band – is to be found a spinner device for false twist. The mentioned module of the spinning unit can be exchanged, even during operation of the machine.

The drive of the drawing apparatus, i.e. of the draw rolls, for example, comprises a counter shaft, which extends itself vertically through the machine. This counter shaft, which is actuated by the electromagnetic coupling, provides at least the power for the first draw zone. This actuation occurs only with dependency on a sensor (not shown) which senses the presence of fiber band.

Service for the making of the false twist, for example, is provided by a pneumatic spinning jet connected on the pressure line of the last pair of the draw rollers, or alternately, a mechanically driven spinning, rotational member.

Advantageous embodiment examples of the invented apparatus are characterized in the subordinate claims.

The advantages of the new achievements for the open end spinning machine are found as follows. It is possible, based upon various technological principles and different designs of the spinning unit, to create a common conception of the open end spinning machine. A machine, fully within the framework of mechanical structure and a complete drive system can be proposed for an open end spinning machine. The open end spinning machine, so designed, would be equipped with rotor and nozzle, or a different type employing a mechanically actuated twisting method, for the making of the said false twist. From this situation, a common solution arises for the concept of the automation equipment for the exchange of filled spools and a higher degree of uniformity for the correction of yarn breakage. The result would be an identical solution of further automatic operations for the transport of full spools, the replacement thereof by empty spools, and eventually even the means for the exchange of empty raw fiber band cans with full cans.

The unification of the system of design of said open end spinning machine, not only enables a reduction in costs, but also allows for the realization and preparation of the production of new types of such machines, which would carry lower expenses for operation and maintenance.

The essentials of the invention as well as further advantages and features thereof are described and explained in greater detail in the following, with the aid of schematic drawings of embodiments, showing the arrangement and function of the proposed open end spinning machine. There is shown in:

Fig. 1 schematically, an open end spinning machine with spinning rotors for the manufacture of bundle yarn,

Fig. 2 the machine of Fig. 1 seen as a top view,

Fig. 3 in profile, a spinning unit with an apparatus for drawing,

Fig. 4 the equipment of Fig. 3 with released arm, and

Fig. 5 a module of the spinning unit with cantilevered bearing supported pressure rolls.

In Fig. 1, the wall 1 of the machine structure is affixed at the floor level with anchor bolts 2. On the said framing, is to be found penetrative borings, and bearing supports for extended shafts. Among the shafts may be named a power supply shaft 3, the draw roll 4 and the windup roll 6. By a (not shown) mechanism, the draw roll 4 exerts pressure on a draw roll 5 by a mechanism (not shown in greater detail). The windup roll 6 rotates a spool, which is to receive yarn. The said spool and accessories are supported on a spool holder 9, which is rotationally held in bearings. The module 20 possesses a first draw roll 21, a middle draw roll 22 and a final draw roll 23. In the case of all draw rolls 21, 22, 23, rolls 31, 32, 33 are thereagainst pressed by respective springs 34. The rolls 31, 32, 33 with the attendant springs are assembled on a releasable arm 30 with a hand grip 36. The said releasable arm 30 pivots about a pin 35. In common with the roll 31, the draw roll 21 forms the first roll-pair to effect fiber band drawing. This roll-pair coacts with a second roll-pair, namely draw/pressure rolls 22, 32, to form the first draw zone. The final roll-pair, i.e., 23, 33, together with previous pair 22, 32 form the final draw zone.

Attached to the final draw zone roll-pair 23, 33, is a spinner device placed suitable for making a false-twist strand. This spinner device is a pneumatic spinner nozzle 40 which is connected through a compressed air line 41 leading from a compressed air distribution point 42.

A supply of fiber band 50 is contained in a can 51. The machine, as shown, possesses a central axis 52, along which a partition wall 53 runs. This partition wall 53 serves for additional structural support and separates the space used for the said cans 51. At the power feed shaft 3, for each spinning station are installed means for the transmission of the torque placed in combination with the drawing equipment. Associated therewith, for example, is a hub (not shown) having an electromagnetic clutch assembly. This is housed coaxially, in a journal box on the main drive shaft 3, wherein twin belt pulleys 11, 12 are to be found. These belt pulleys 11, 12 drive belts, preferably toothed belts 24, 25. The belts are kinematically bound to the draw rolls 21, 22 of the first draw zone.

In Fig. 2, visible is a row of adjacently ordered modules 20 with the drawing apparatuses, which, in common with the spinner device designed for the making of a false twist, are intended for a spinning unit. The group of the spinning units form a station, the wall 1 thereof forms a carrying member for the machine. One component of the drawing apparatus is formed by the last draw roll 23, which extends itself along the side of the machine. Further, the drawing apparatus is affixed to a side wall 100, and controllingly attached to a (not shown) well known, separate drive mechanism. This drive mechanism may be a Variator, an encased gear train, or similar device.

On the continuous power feed shaft 3, is placed a hub 26 with an electro magnetic clutch arrangement for shutting off the belt pulleys 11, 12. These pulleys 11, 12, recommended as being toothed, are rotatively mounted on, or integral with the said power shaft 3. The transmission of the torque to the (not shown) draw roll of the first draw zone of like spinning units installed beside one another is carried out by the belts 24, 25, which correspond to pulleys 11, 12.

In Fig. 3, the module 20 of the spinning unit is fastened by a cover 200 to a tube 301. Tube 301 concentrically encases the main power shaft 300, running along the length of the machine. Tube 301 is turnably supported in bearings upon which, for each spinning unit, a worm gear drive is provided. This worm gear arrangement, as seen in Fig. 3, engages a gear 68, which is nonslidable on a counter shaft 60. At the location of the double sided engagement of the worm gear combination with the gear 68, a cut-out excision is made in tube 301. Slidably encircling the counter shaft 60, is an electro magnet 65, which is provided with means for the transmission of the torque. These means can include a friction clutch, or a coupling of gears, a come-along rod with an opening or an edge in a counter piece. The said clutch acts upon the gear 64, which is likewise, turnably installed on the counter shaft 60. The said counter shaft 60, again as seen in Fig. 3, is turnably supported on bearings 61, 62, enclosed by the housing 20 and the cover 200 of the module. The gear 63 can be stationarily affixed on the counter shaft 60, whereby it exercises a constant rotational effect on the draw roll 22. Conversely to this, the gear 63 can be turnably set with a firm engagement with the said gear 64. In the latter case, when the release arm 30 is closed the turning effect on the draw roll-pair 21, 22 becomes commonly activated. That is to say, this occurs when the arm 30 is closed, and the electromagnetic clutch arrangement 64, 65, 67 likewise closes.

The drawing apparatus consists of:

- A. the first draw roll 21, which is releasably bound to the drive source, namely 210, 64, 65, 67, 68, 300,
- B. from which the second draw roll 22, which can be alternately either in a continuous or in a released connection with the drive source, depending upon the operational condition of the spinning unit, and finally
- C. from the final draw roll 23, which is either installed on the shaft which extends itself longitudinally through the machine or is bound with another drive source of the machine.

The compression springs 34 on the pivoted release arm 30 press against the draw cylinders 21, 22, 23. The swingable arm 30 pivots itself around a pin 35 and has on the end remote from said pin a hand grip 36. The pair of draw rolls 22, 32 carry draw belts 221, 321 for the guidance and the monitoring of the fiber band in the draw field up to the immediate proximity of the pressure line of the final roll-pair 23, 33. At the outlet side of the said final roll-pair is to be found an entry head 44 for the spinner nozzle 40, which is fastened by a holder 45. The holder 45 itself is affixed to the body 20 of the spinning unit by a bolt 46.

In Fig. 4, the module 20 of the spinning unit is fastened by means of the cover 200 at the tube 301, within which tube the power feed shaft 300 is turnably supported on bearings. The fiber material, now in the form of fiber band 51, enters the first draw zone, and progressively as it travels, becomes more and more refined, until it appears threadlike 511 at the outlet of the third draw roll-pair 23, 33. At this point, the fiber band now enters the spinning rotor 40, which it leaves, characterized as a bundle yarn 512.

The first drawing roll 21 is fastened in the module 20 in cantilever fashion with a bearing 211. The final draw roll 23 may conform in source of power to the first and second draw rolls, or it may have its own continuous power shaft, as will be later described.

The dotted lines show the drawing pressure line of the final pair of the draw rolls. The spinning rotor 40 is aided by an entry head 44, which incorporates an entry zone 440 for the fiber band and is affixed by the holder 45 and the bolt 46, which latter penetrates the spinning unit module 20 casing. In the first draw zone, the fiber band 51, 511 is transported through a separator 37, by means of which the band is divided into two parallel partial strands.

The function of the invented open end spinning machine is as follows:

The supply of fiber is introduced as prepared fiber band, into the drawing apparatus, where the said band is subjected to two draw zones. In the first of the said two draw zones, the fiber band is run by a guide member through a compressor and/or a divider 37. In the divider 37 the fiber band is split into two, parallel running strands. In the second draw zone, the so treated fiber band is further drawn, up to the desired degree of extension, and the edge fibers are turned off to the side. In this condition, at the output side of the pressure line of the final draw pair, the fiber band is directed into the pneumatic spinning rotor, which imparts a false twist thereto. A winding is then established about the non-twisted core of a bundle yarn by means of the undoing of the turned fibers of the said false twist.

For the false twist formation, it is possible that other turning means can be employed, for example, a mechanically driven miniature spindle, which possesses a mechanism, or an assembly, for the transmission of torque onto the traveling staple fiber yarn.

Where open end spinning machines are concerned, it is characteristic, that the drawing apparatus possesses a modular form in combination with the spinner device for the production of the false twist. The spinning units which comply with this arrangement are set successively, next to one another to make a complete installation. Considering the drive of such a multiple arrangement, the power supply must be controllable with respect to the state of the immediate activity. Especially, in the case of yarn breakage, the operator should be able to shut off the transmission of torque on the first drawing roll-pair. This is carried out by decoupling the electromagnetic clutch which is installed on the counter shaft 60 (see Fig. 3) to serve as drive for the drawing roll-pair of the first draw zone. Advantageously it is possible to simultaneously shut off the drive of the second draw roll-pair.

The final draw roll-pair, including roll 23, can have a separate drive, and in a case of at least one embodiment, this can be in the form of a continuous shaft 230 extending itself completely along the successive machines. The transmission of the drive and the selection of the speed of the first and final drawing rolls lies in the area of preselection. The decision would rest on the desired magnitude of pull (draw) and the consequent optimal, adjustable value for the linear weight (Kg/m) of the yarn to be manufactured.

The invented open end spinning machine is conditioned for the production of bundle yarn of staple fibers. The modular assembly allows a unified conception of the machine and an automatization both for the rotor spinning principle as well as for the production of a bundle yarn with the use of the pneumatic spinning nozzle. Alternate thereto, would be other acceptable methods for the making of false twist. It is a



possibility easily reached, to employ both spinning principles alternately on one machine. One can achieve this also by a partial operation, that is to say, make the exchange on one half of the mirror image machine.

The invented open end spinning machine was conceived with the goal of creating a unified design of a rotor based, open end spinning machine in a modular embodiment, in particular, applied to the production of bundle yarn. The described machine is characterized, in that at each spinning station, while taking into consideration:

- (A) attention to one of the driving means of the machine in the system of the spinning unit,
- (B) a means for the transmission of its torque and
- (C) an assembly of the components of a drawing apparatus,

it becomes possible to shut off power within the first draw zone. Further, at the final draw zone a spinner device for the imposition of a false twist on the fiber band is installed and the drive for the final drawing roll-pair is derived from power sources of the machine itself.

## CLAIMS

Claimed is:

1. An open end spinning machine for the spinning of yarn from a fiber band, said machine being part of one side of a row of yarn winding stations and includes a fiber band container with a driving means provided for one or more machines, therein characterized,  
in that at each spinning station for at least one of the driving means (3, 4, 6, 300) for the machine above the container (50) of the fiber band (51) in the module (20) of the spinning unit middle (11, 12, 24, 25, 68, 64) for the transmission of torque of one of the driving means of the machine, and drive for drawing the fiber band, the assembly of which components constitutes a drawing apparatus, wherein the at least first draw zone, which possesses the said means for the transmission of torque, controlled with consideration for the operational condition of the spinning station, can be shut off and  
in that a spinner device (40) for the making of false twist of fiber band is provided proximal to at least one roll (23) of the final roll-pair (23, 33) of the drawing apparatus, the drive of which is derived from one of the above mentioned drive means of the machine, this said device being located downstream in the direction of the advancing movement of the fiber band (51) being drawn, and finally, the module of the spinning unit can be exchanged, even during operation of the machine.
2. An open end spinning machine in accord with claim 1, therein characterized, in that the driving means of the machine at the spinning station is a transmission gearing with an output counter shaft governed by ratio members, provided with an electromagnetic clutch, whereby the ratio members of the said counter shaft are in engagement at least with the draw rolls of the first draw zone of the drawing apparatus of the spinning unit.
3. An open end spinning machine in accord with claims 1 and 2, therein characterized, in that in the yarn windup sector or in the sector of the fiber band inlet in the spinning unit, the spinning station is equipped with a sensor to register the presence of a fiber band which said sensor is installed in the electrical circuit of the electromagnetic clutch of the of the output counter shaft.
4. An open end spinning machine in accord with claim 1, therein characterized, in that the driving means of the machine at the spinning station is provided with an electromagnetic clutch with means for a transmitting connection (kinematic connection) with at least one draw roll of the drawing apparatus of the spinning unit.

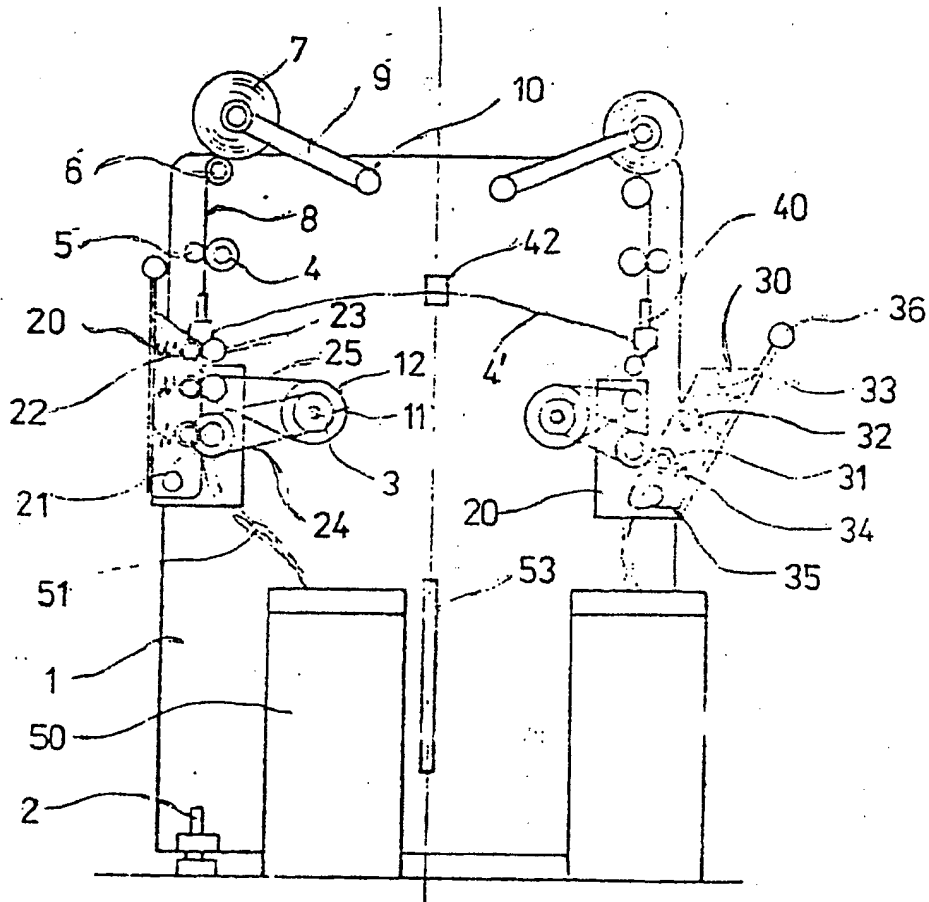
5. An open end spinning machine in accord with the claims 1 to 4, therein characterized, in that at least two successive draw rolls of the draw zones of the drawing apparatus are connected to one another by a stepped transmission gearing.
6. An open end spinning machine in accord with claim 1, therein characterized, in that the spinner device for the production of the false twist is made as a single pneumatic nozzle, the intake opening of which is assigned to the position of the pressure line of the final draw roll pair of the drawing apparatus.
7. An open end spinning machine in accord with claim 1, therein characterized, in that a separating member is in the first zone of the drawing apparatus in the direction of the course of the fiber band to be stretched, and said separating member possesses a central projection for the symmetrical, longitudinal division of the fiber band to be drawn.
8. An open end spinning machine in accord with claim 1, therein characterized, in that prior to the first zone of the drawing apparatus, guiding and holding means are provided.
9. An open end spinning machine in accord with claim 1, therein characterized, in that the spinner device for the production of the false twist is a mechanically driven rotating member.
10. An open end spinning machine in accord with claim 1, therein characterized, in that the body, that is to say, the housing, or further, the assembly of the components of the spinning unit, is bearing supported on a rotor by means of openings, which surround the driving means of the machine for the output counter shaft.
11. An open end spinning machine in accord with claim 1, therein characterized, in that the draw roll, in least at the first draw zone possesses a cantilevered bearing in the housing of the assembly of the spinning unit.
12. An open end spinning machine in accord with claim 1, therein characterized, in that it is equipped with a traveling service automat to move along the row of spinning stations, which automat acts with a dependency upon the current operational condition.
13. An open end spinning machine in accord with claim 1, therein characterized, in that the final draw roll of the drawing apparatus is made by a continuous shaft, which is coupled in a predetermined (selected) ratio relationship with the shaft of the draw roll of the yarn removal apparatus.

14. An open end spinning machine in accord with the claims 1 and 5, therein characterized, in that the inlet roll pair of the draw rolls is coupled with the successive roll pair of the draw rolls at a predetermined rotational ratio, while the drive of an output roll pair of the draw rolls possesses an independently regulated drive.
15. An open end spinning machine in accord with the claims 1 and 13, therein characterized, in that a controllable, kinematic binding exists between the drive of the outlet roll pair of the draw rolls of the drawing apparatus and the drive of the draw rolls of the yarn delivery apparatus.
16. An open end spinning machine in accord with claim 1, therein characterized, in that the machine frame equipped with driving means carries a plurality of modules, which individually can be exchanged, even during the operation of said machine, and the same geometric locations and fastenings exist for their being affixed to the said machine framing, and at the same geometric locations, movements from the shafts within the said framing are transmitted to rotating parts of the spinning apparatus, although in their interior they are equipped with spinning devices of various kinds.
17. An open end spinning machine in accord with claim 16, therein characterized, in that in the machine framing, the same fiber band storage and/or supply containers (cans) as well as the same removal and spool apparatuses, and on the machine framing is provided a unified feeding and/or spool change and/or removal apparatus.

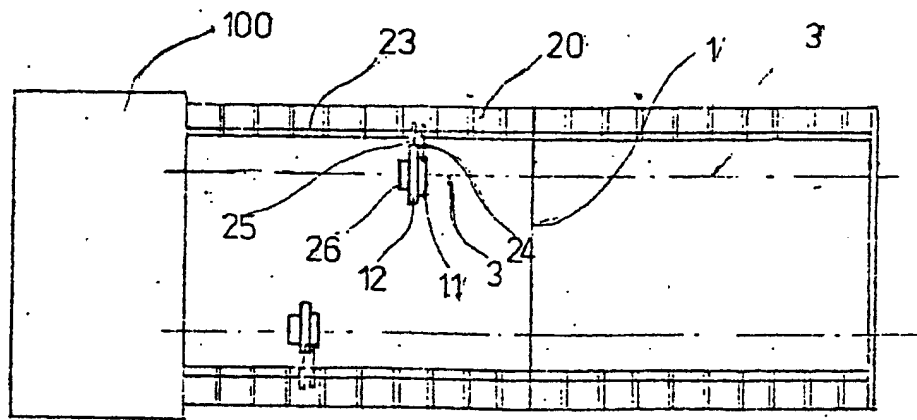
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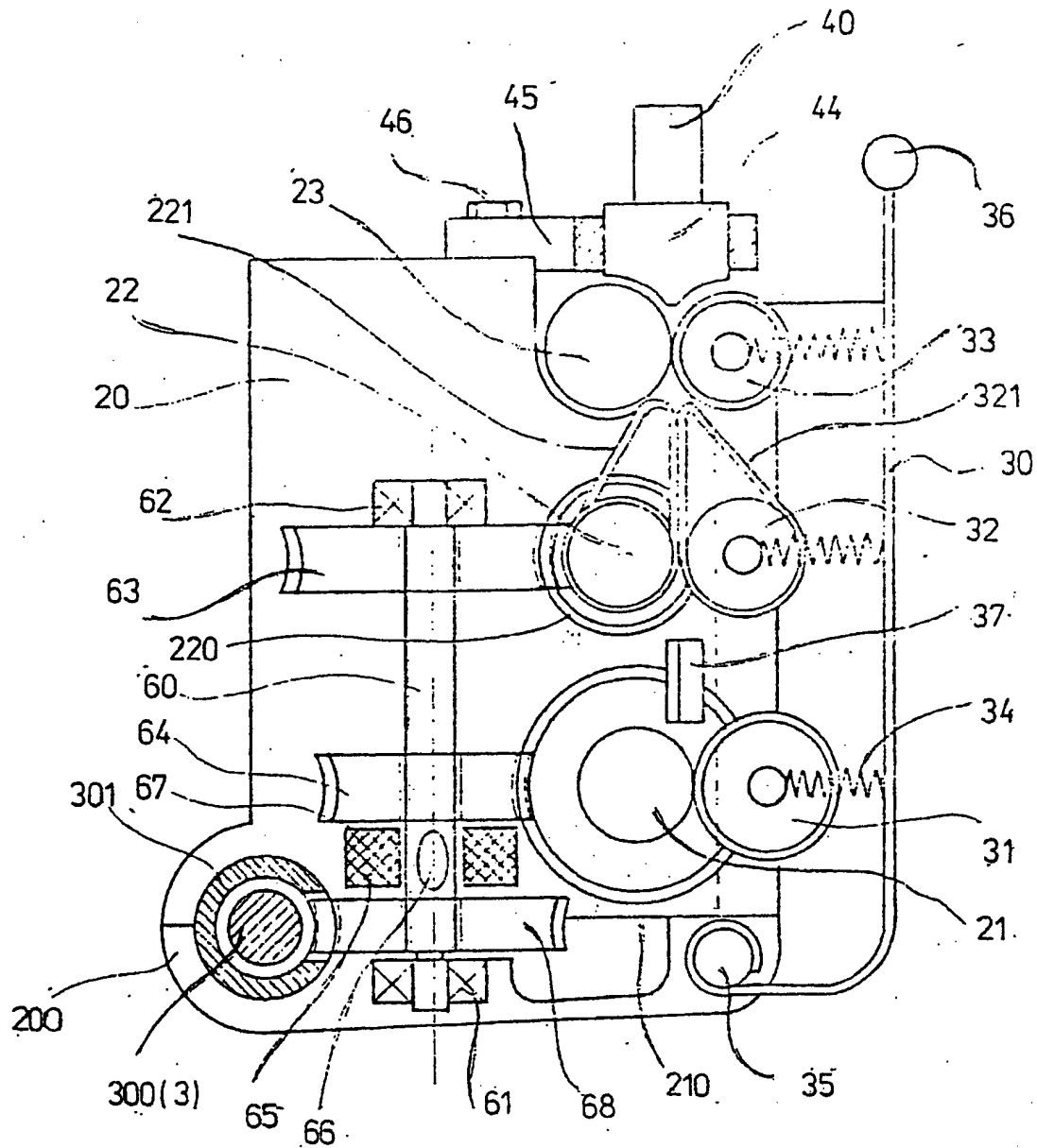


**Figur 1**

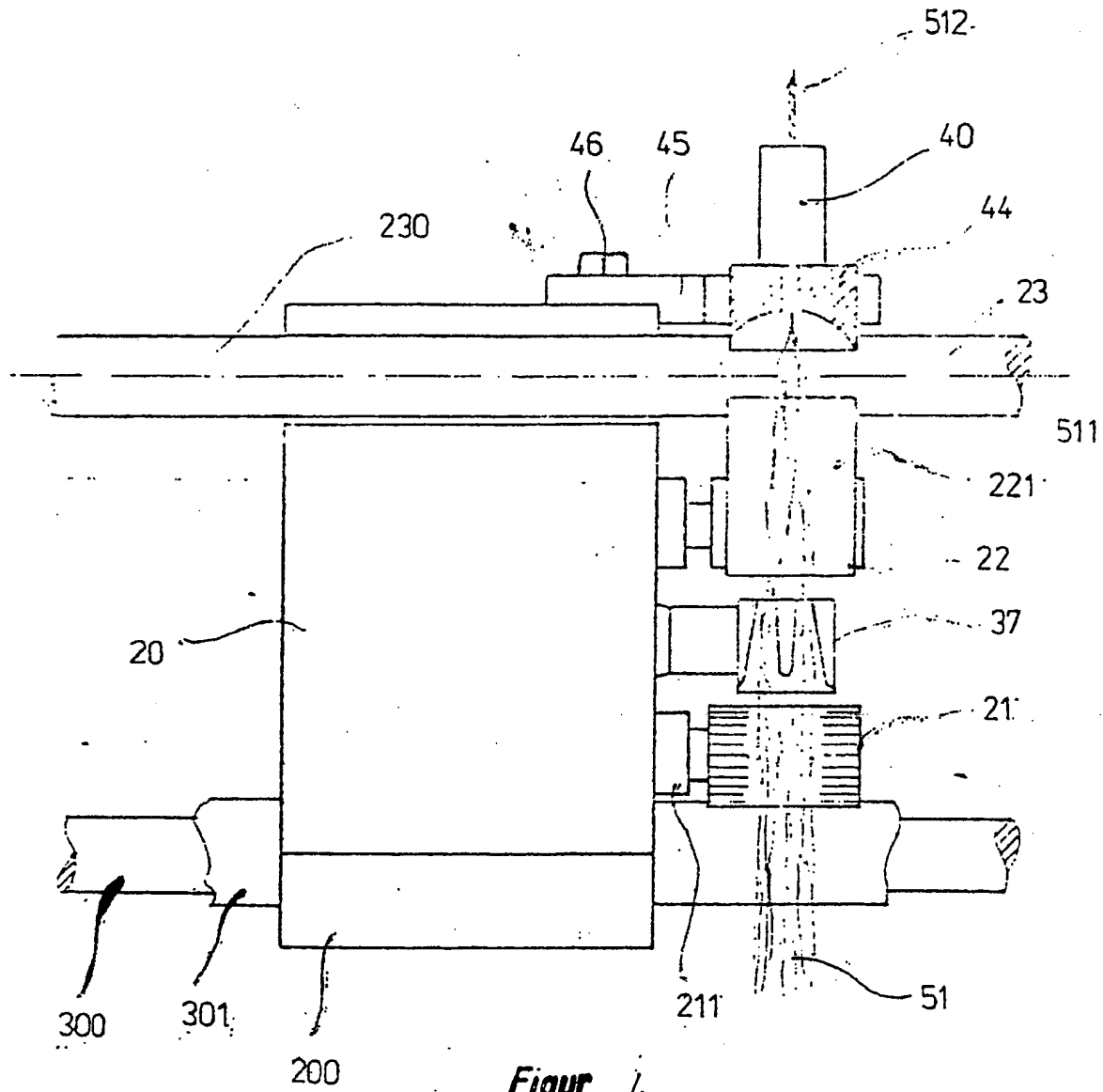


**Figur 2**

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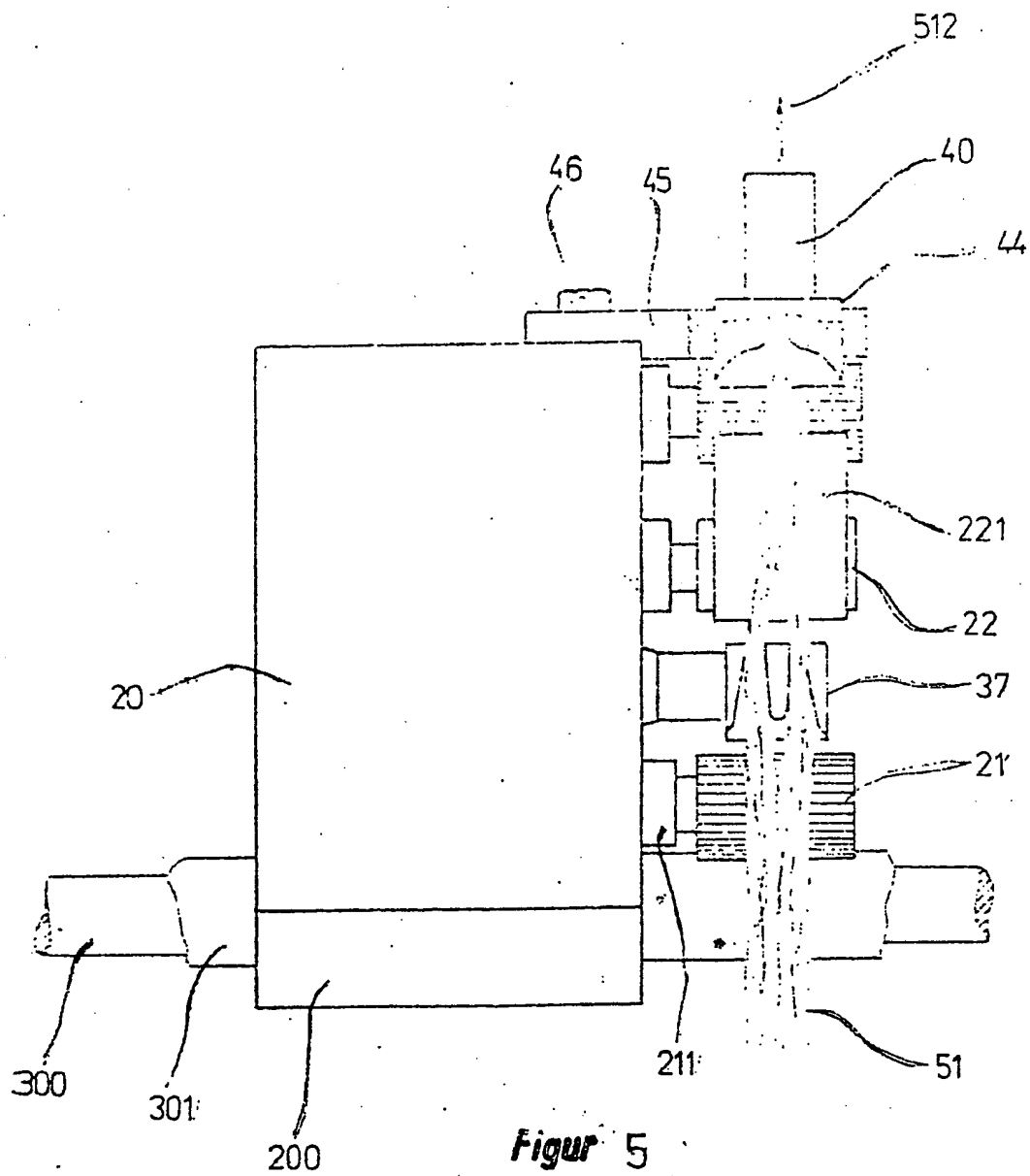


Figur 3.



**Figur 4**

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